

## **Remarks**

Claims 1 - 3, 6, 7, 10, 12, and 14 are pending. Favorable reconsideration is respectfully solicited.

Applicants continue to traverse the restriction requirement, as its basis is in error. The Examiner states that pyrogenic silicas direct from the burner are different from pyrogenic silica which is stored. As can be seen from the specification on page 4, silicas which come directly from the burner are hydrophilic as are also pyrogenic silicas which have been stored or commercially packaged. Whether direct from the burner or after storage, both are hydrophilic silicas. Claim 1 has been amended to restrict the metal oxide to silica. Claims 4 and 5 have been cancelled as redundant. Claim 7 has been amended to be dependent upon claim 1, thus incorporating all the limitations of claim 1. Per MPEP 821.04, the claims, being product and process of manufacture claims, should be rejoined. Claims 8, 9, 11, and 13 have been cancelled. Claims 10, 12, and 14 have been amended to further limit the composition of claim 7. Rejoinder is thus solicited.

Claim 7 has been rejected under 35 U.S.C. § 112 ¶1. The claimed silicas are characterized not only by the % carbon but also by other parameters. These other parameters do not allow for 0% carbon, and thus "less than 0.1% carbon" must be taken in conjunction with the other parameter requirements, and does not read on 0%. However, to expedite prosecution, Applicants have amended claim 7 to recite "more than 0%", per the Examiner's thoughtful suggestion. Withdrawal of the §112¶1 rejection is solicited.

Claim 7 has also been rejected under 35 U.S.C. § 112¶1 for reciting a methanol number less than 30. The Office states that silica with a methanol number of "0" is no longer even partly hydrophobic. This is incorrect. As can be seen in Table 1 on page 22, three subject invention examples have a methanol number of 0. However, these silicas are still partly hydrophobic, as can be seen from both their %C content and their contact angle  $\theta$ . Silylation always renders a silica less hydrophilic, and either partly hydrophobic as in the

subject invention, or completely hydrophobic as in the prior art. Completely hydrophobic silica cannot be used as a thickener or stabilizer in aqueous compositions as it is not wet at all by water. Withdrawal of the rejection of claim 7 under 35 U.S.C. § 112 ¶1 is solicited.

Claim 7 has been rejected under 35 U.S.C. § 102(b) as anticipated by Barthel et al. U.S. Patent 5,686,054 ("*Barthel*"), or under 35 U.S.C. § 103(a) as obvious over *Barthel*. Applicants respectfully traverse this rejection.

*Barthel* is directed to fully hydrophobic silicas in which all surface silanol groups are silylated. These silicas are highly apolar. See, e.g. column 1, lines 43 - 47. See also column 8, line 62 to page 9, line 9, where *Barthel* indicates that no silanol groups can be detected, and where the methanol number is greater than or equal to 50, more preferably greater than 65 and 75, respectively. Note also column 9, line 41 where *Barthel* teaches against the use of silicas which still contain some silanol groups (which would be partly hydrophobic), since these destabilize polar systems, e.g. aqueous systems. However, *Barthel's* completely hydrophobicized particles cannot be used in aqueous polar systems, since they are completely non-wettable. Rather, they are suited for polar non-aqueous systems such as epoxy resins and formulations containing alcohols or other polar solvents (ketones and alkylesters for example).

The Office reasons that *Barthel's* process parameters are within the claimed range, and therefore produce the claimed silicas. It must be noted, that claim 7 not only contains process parameters (as amended), but also contains product limitations. Thus, not only must the product be made by the process, i.e. contain silylating agents I and/or II in the prescribed amounts, they must also possess the carbon content, methanol number, surface silanol group content, surface coverage  $\tau$ , etc.

*Barthel* does not disclose the process limitations, i.e. an amount of 0.015 mmol/g to 0.15 mmol/g per 100 m<sup>2</sup>/g of BET surface area, nor does *Barthel* disclose any of the claim limitations of surface silanol content of 0.9 to 1.7 SiOH/nm<sup>2</sup>, methanol number, etc.,

nor are any of these inherent. To illustrate the non-inherency, Applicants prepared three silicas in their Burghausen, Germany laboratories. One silica was prepared in accordance with the subject invention, and produced a water wettable silica with a methanol number of zero. The second two silicas were prepared by a non-inventive method, but have virtually identical carbon content as compared with the subject invention example. This information can be presented in the form of a Rule 132 Declaration if the Examiner wishes.

Example 1 (according to the invention)

At a temperature of 25°C and under N<sub>2</sub> inert gas, 100 g of hydrophilic silica with a moisture content of less than 1%, an HCl content of less than 100 ppm, and with a specific surface area of 200 m<sup>2</sup>/g (measured by the BET method in accordance with DIN 66131 and 66132) available under the name HDK N20 from Wacker-Chemie AG, Munich, Germany, are mixed by atomization through a one-fluid nozzle (pressure: 5 bar) with 2.56 g of a mixture of 0.56 g of H<sub>2</sub>O and 2.0 of MeOH and 4.29g of dimethyldichlorosilane. The silica thus loaded is reacted at 250°C in a 100 L drying cabinet under N<sub>2</sub> for a residence time of 2 h. The analytical data are listed in Table 1.

Example 2 (non-inventive; aim: same carbon content as example 1 but different silica)

At a temperature of 25°C and under N<sub>2</sub> inert gas, 100 g of hydrophilic silica with a moisture content of less than 1%, an HCl content of less than 100 ppm, and with a specific surface area of 100 m<sup>2</sup>/g (measured by the BET method in accordance with DIN 66131 and 66132) available under the name HDK N10 from Wacker-Chemie AG, Munich, Germany, are mixed by atomization through a one-fluid nozzle (pressure: 5 bar) with 2.56 g of a mixture of 0.56 g of H<sub>2</sub>O and 2.0 g of MeOH and 4.29 g of dimethyldichlorosilane. The silica thus loaded is reacted at 250°C in a 100 L drying cabinet under N<sub>2</sub> for a residence time of 2 h. The analytical data are listed in Table 1.

Example 3 (non-inventive; aim: same carbon content as example 1 but different organosilicon compound)

At a temperature of 25°C and under N<sub>2</sub> inert gas, 100 g of hydrophilic silica with a moisture content of less than 1%, an HCl content of less than 100 ppm, and with a specific surface area of 200 m<sup>2</sup>/g (measured by the BET method in accordance with DIN 66131 and 66132) available under the name HDK N20 from Wacker-Chemie AG, Munich, Germany, are mixed by atomization through a one-fluid nozzle (pressure: 5 bar) with 8.21 g of a mixture of 1.79 g of H<sub>2</sub>O and 6.42 g of MeOH and 9.90 g of methyltrichlorosilane. The silica thus loaded is reacted at 250°C in a 100 L drying cabinet. The analytical data are listed in Table 1.

Table 1

Example	%C	% SiOH Radicals	Water Wettability	Methanol Number
1	0.82	71	Yes	0
2	0.85	43	No	45
3	0.81	48	No	40

As can be seen from the tabulated results, the carbon contents of each of the silicas were substantially identical, yet the second and third examples (comparative) were not water wettable (i.e. completely hydrophobic), with methanol numbers much higher than those claimed, although still lower than those of *Barthel*, who requires a methanol number of 50, minimally.

The comparative examples use amounts of silylating agents within the range disclosed by *Barthel* and cited by the Examiner on page 4 of the Office Action, yet did not result in a silica as claimed in claim 7.

In a rejection based on inherency, the inherency must be certain and must be a necessary result, not merely a possible or even probable result. See, e.g. *Mandy N. Haberman v. Gerber Products, Co.*, Slip Opinion 2006 - 1490, - 1516 (May 29, 2007; non-precedential); *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991) (extrinsic evidence used to fill a gap in a reference “must make clear that the missing descriptive matter is necessarily present in . . . the reference . . .”); and *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981) (inherency “may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” (emphasis added)). Here, the preparation of a silica within the scope of claim 7 is not even possible according to the *Barthel* reference, as that reference teaches silylating all silanol groups, thus resulting in a silanol concentration of 0 SiOH/nm<sup>2</sup> rather than Applicants’ claimed range of 0.9 to 1.7 SiOH/nm<sup>2</sup>. *Barthel* requires a methanol number of minimally 50 (and preferably higher), while Applicants require a methanol number of 30 or less. Thus, there is no anticipation by *Barthel*.

Nor does *Barthel* render the claimed invention obvious. *Barthel* teaches against silicas which still contain non-silylated SiOH groups (0.9 to 1.7 SiOH/nm<sup>2</sup> are required by Applicants’ claims). *Barthel* also requires minimally a methanol number of 50. *Barthel* does not teach or suggest preparing any silicas within the scope of the claims; rather, he specifically teaches against doing so. The Office states that:

“ . . . it would be obvious to determine the optimum values of the relevant amount of silylating agent in the prior art through routine experimentation to achieve the desired degree of hydrophobicity. . . “

This is true so far as it relates to the optimum within *Barthel*’s teachings. For example, it would likely be routine experimentation to determine whether a *Barthel* fully hydrophobicized silica should have a methanol number of, say, 68 from his range of 50 - 100. However, that is as far as routine experimentation goes. It is not obvious, and has never been viewed obvious



under the law, to deviate completely from the references teachings and to sail without direction into uncharted waters. The reference must provide some motivation to do what Applicants have done with respect to the claim limitations such as silanol content and methanol number. *Barthel* does not direct the skilled artisan to “optimize” outside of his disclosed invention. Rather, he directs the skilled artisan not to have a methanol number below 50, and to have no silanol groups. Such teaching away is “strong evidence of non-obviousness.” *W.L. Gore v. Garlock*, 220 USPQ 303 (Fed. Cir. 1983). This has been the law for more than 20 years. Withdrawal of the rejection of the claims under 35 U.S.C. § 103(a) is solicited.

Claim 7 has been rejected as anticipated under 35 U.S.C. § 102(b) or in the alternative under 35 U.S.C. § 103(a) as obvious over Tojo et al. U.S. 5,278,204 (“*Tojo*”). Applicants respectfully traverse this rejection as well.

*Tojo* discloses the use of what appears to be completely silylated (fully hydrophobic) silicas in rubber compositions. The silylated silicas are silylated with a silane having a chloroalkyl, chloroalkenyl, or alkenyl group, these groups serving as coupling agents between the silica particles and the rubber. It is well known, for example that such groups bind strongly to rubber, either as unreacted (in the case of chloroalkyl groups) or following addition reaction (unsaturated groups) during vulcanization. *Tojo* also teaches the use of fully hydrophilic (untreated) silica, but only in conjunction with a chloroalkyl- or alkenyl-functional polyorganosiloxane which hydrophobicizes the silica *in situ*, as is well known. Those skilled in the art are aware that fully hydrophobicized silicas, whether pre-hydrophobicized or hydrophobicized *in situ* are used in such compositions, as hydrophilic silicas are exceptionally difficult to mix and do not bond well to the rubber. Moreover, from a commercial standpoint, to which all patents are directed, no one would consider using a partially silylated silica as fully silylated silicas are much more easily incorporated into the rubber matrix, thus saving process time, and the cost of a partially silylated silica would not be very different from the cost of a fully silylated silica, as the basic silica raw material and the process steps and their duration are identical in each process. Only the amount of silylating agent is different, but not

by much based on product weight. Doubling the amount of silylating agent, for example, from 2% to 4% would involve only the use of 2% by weight more of silylating agent.

*Tojo* does not disclose, nor does he teach or suggest the claim requirements of the silica of claim 7. The residual silanol content is not disclosed, and neither is the methanol number. As explained earlier with respect to *Barthel*, the silica surface area can vary greatly, as can the original silanol content. Both of these characteristics greatly affect the amount of silylating agent which must be used. For example, in column 5, *Tojo* indicates preference for silicas formed under anhydrous conditions, because it has a relatively low silanol group content, and thus can be completely hydrophobicized using less silane. *Tojo* Example 1 employs a chloropropyltrimethoxysilane as a silylating agent for a dry method silica of BET surface area of 200 m<sup>2</sup>/g. No silanol content, a very important parameter, is given, however it is assumed that this silica has a very low silanol content, and thus the silylating agent is present in sufficient quantity to completely hydrophobicize the silica. Thus, not only does *Tojo* not literally disclose the claim limitations, he also does not disclose them by inherency, as indicated by the prior discussion with respect to *Barthel*. Withdrawal of the rejection under 35 U.S.C. § 102(b) is thus solicited.

Nor does *Tojo* teach or suggest producing a silica with the claimed surface silanol content and methanol number (or coverage degree,  $\tau$ ). The Office is respectfully reminded that principles of inherency do not apply to obviousness rejections. There must be a concrete teaching or suggestion for each claim limitation. *Tojo* does not even mention methanol number or silanol content. See, e.g. *In re Shetty*, 195 USPQ 753, 757 (CCPA 1977); *In re Naylor* 152 USPQ 106, 108 (CCPA 1966); *In re Spormann* 150 USPQ 449, 452 (CCPA 1966).

Applicants created their specific partly hydrophobic silicas for use as rheology modifiers and emulsion and dispersion stabilizers, while *Tojo* uses his fully silylated silicas as reinforcing fillers for rubber compositions. The compositions for which Applicants silicas were developed are far different from those of *Tojo*, and the function of the respective silicas

are totally unrelated as well: Applicants' for rheology modification and stabilization; *Tojo's* for increasing the strength of rubber while decreasing deterioration with age. The problems addressed by Applicants and *Tojo* are completely unrelated. Thus, *Tojo* would not direct the skilled artisan to solve Applicants' problem, a problem which *Tojo* does not even come close to mentioning. It is well established that a reference which does not even discuss the problem cannot suggest its solution, and thus cannot render the invention obvious. *In re Shaffer*, 108 USPQ 326 (CCPA 1956). This has been the law for more than 50 years.

For all of the above reasons, withdrawal of the rejection under 35 U.S.C. § 103(a) over *Tojo* is solicited.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion will advance the prosecution of the Application, the Examiner is highly encouraged to telephone Applicants' attorney at the number given below.

Please charge any fees or credit any overpayments as a result of the filing of this paper to our Deposit Account No. 02-3978.

Respectfully submitted,

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